

Blue Book 2008 - Balanced Estimates of Gross Domestic Product using a Supply and Use Approach

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Introduction

The ONS is currently in a process of modernising the systems and methods used to produce the National Accounts. Details of these plans, and how they feed into the 2008 Blue and Pink Books and future publications are given in Humphries (2008)¹.

On 24 October 2008, ONS published the 2008 Blue Book and Pink Book, which implemented the first set of changes arising from the National Accounts modernisation programme. As part of this implementation, the 2008 Blue and Pink Books incorporated a revised annual balance for current price Gross Domestic Product (GDP) for 2004, as well as first estimates for 2005 and 2006 balanced using a new Supply and Use (SUT) approach. This article gives some details of the latest results, along with a number of annexes providing summary explanations of the different measures of GDP, the differences between the old and new SUT approaches, and the new methods used. Supply and Use tables for 2004 to 2006, containing all the industry, product and component detail being published are available separately on the National Statistics website².

The Blue Book 2008 Balance

In balancing the Blue Book 2008 dataset, revisions prior to 2004 were only included for the improved treatment of Financial Intermediation Services Indirectly Measured (FISIM). All other data prior to 2004 were as included in the Blue Book 2007 dataset. This article will not deal with these FISIM revisions, as they have already been covered in Meader and Tily (2008)³, but will concentrate on the Supply and Use balancing element of the Blue Book 2008 exercise.

Figure 1 shows the overall level of GDP in current prices for each year from 2003 to 2006, along with the annual growth rates for each year. The revisions columns for the levels shows the effect of the FISIM revisions mentioned above, as well as the revisions as a result of SUT balancing. Revisions shown are against latest published in June 2008.

Figure 1 - Blue Book 2008: Balance and Revisions

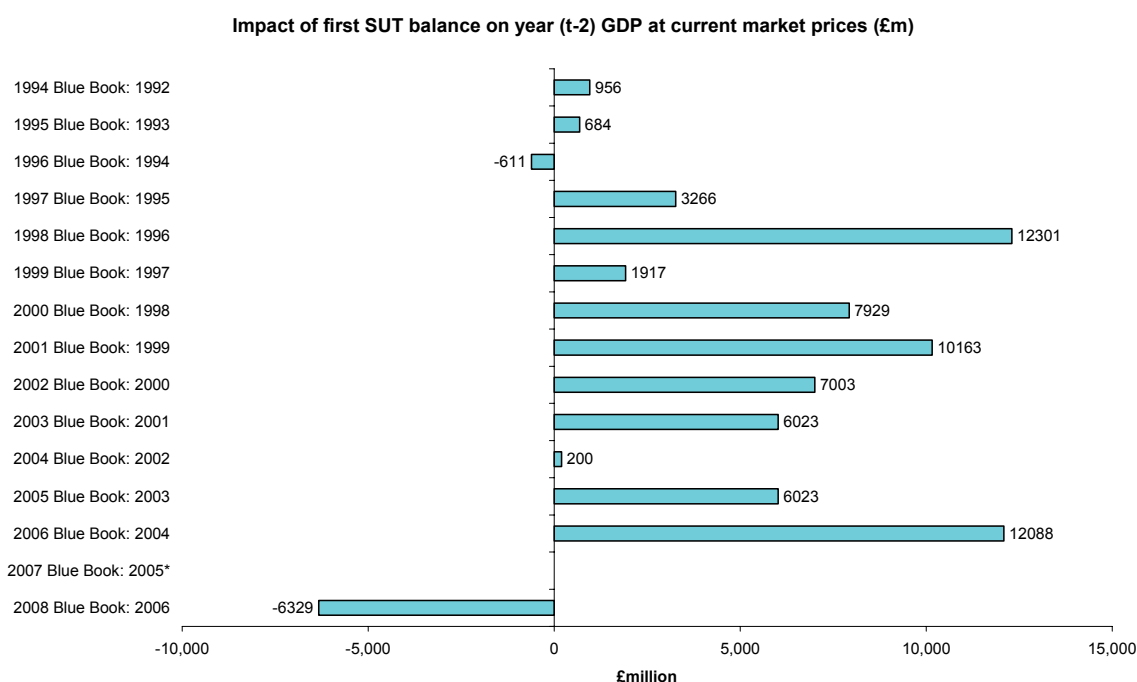
	Level (£bn)				Annual Growth (%)	
	Balance	Revision			Balance	Revision
		Total	FISIM	Supply & Use		
2003	1139.7	21.5	21.5	0	6.0	0.1
2004	1200.6	16.3	22.2	-5.9	5.3	-0.6
2005	1252.5	18.5	22.5	-4.0	4.3	0.1
2006	1321.9	17.9	24.3	-6.3	5.5	-0.1

Comparison of the Balance for Blue Book 2008

Initial GDP estimates for any year (t) are first published in the year following (t+1), but are not normally balanced through the Supply and Use process until two years after (t+2), due to the of availability of the various data sources. Estimates for 2006 were therefore first published in the 2007 Blue Book, and were first balanced through the Supply and Use process in 2008. Estimates for 2005 however, whilst first published in 2006, and revised in 2007, were not balanced through the Supply and Use process until 2008, one year later than normal, because Supply and Use balancing was suspended during Blue Book 2007 (as described in Beadle (2007)⁴).

Figure 2 below compares the revisions resulting from the first SUT balance for 2006 (excluding the revisions to FISIM), with equivalent revisions from first SUT balances from previous Blue Books⁵. Revisions for 2006 are against latest published in June 2008.

Figure 2



* *There was no SUT balance in Blue Book 2007, so comparable figures for 2005 are not available.*

As mentioned above, SUT balancing was suspended for the 2007 Blue Book, so no comparable figures are available for 2005. The revisions resulting from balancing 2006 show a similar magnitude to earlier years, but negative rather than positive revisions as have usually been the case.

Evolution of the 2008 Blue Book Balances

The GDP balances compiled during Blue Book 2008 were derived using a different Supply and Use approach to those produced previously. This new approach has been developed based on agreed international best practice⁶ for the compilation of Supply and Use tables. Balancing has concentrated initially on the imbalances between Supply and Demand, rather than the imbalances between the Production and Income measures of Value Added which was the method used previously. Supply and Demand imbalances are adjusted in the initial balancing iteration, with the Value Added imbalances being addressed in the second iteration. Balancing then takes place via a number of iterations with imbalances between Supply and Demand estimates and Value Added estimates being adjusted in turn until a final balance is achieved. A more detailed description of the balancing process is given in Annex B.

This new approach to balancing the Supply and Use estimates may be responsible for the change in the direction of the balancing revision for 2006 represented in figure 2 above. In approaching the imbalance

between Supply and Demand first, we are considering the imbalance between the Production and Expenditure measures of GDP, rather than the imbalance between the Production and Income measures, as had been the case in previous Supply and Use balances. Given the significant imbalance between the Production and Expenditure measures of GDP in the initial unbalanced Supply and Use estimates, it is not surprising that the resulting balance presents a more central estimate between the production and expenditure measures.

The reliability of the balance for Blue Book 2008

Production of the data used as input to the Supply and Use table framework has taken place on a number of different compilation systems for Blue Book 2008. Some of these were the legacy systems used for previous Blue Book production rounds whilst others used new methods and systems forming part of the output from developments to modernise the national accounts^{1;4}. As such the methods and data used were, in some cases, different to those which have been used in the past. Alongside these changes in compilation methods, revised benchmark data for 2004, and new benchmark data for 2005 and 2006 have been taken on for the first time. Changes in coverage, such as the measurement of FISIM and Own-account Software, have also been incorporated since Blue Book 2006. Neither of these changes were present when the Supply and Use framework was last used for balancing in Blue Book 2006.

New modernised systems have been designed to derive estimates starting from 1997. To fully reflect the results from the new systems, methods and processes, all years from 1997 would need to be rebalanced through the SUT process. There remain, however, some systems still to modernise, so a decision to balance all years has been delayed until a future date when the majority of systems have been modernised and the need to rebalance can be assessed. Therefore SUT balancing was conducted only for 2004 to 2006.

This decision to open only a limited number of years creates the potential for discontinuities between the first year that is open for balancing and the last year which remains closed. This has been the case for Blue Book 2008. To minimise the potential impact of discontinuities data has been reviewed and adjusted as part of the balancing process. This makes balancing more difficult because not only are we trying to confront the data and deal with any inadequacies in terms of concepts and coverage, we also need to limit the impact of discontinuities. This presents a significant challenge, but one that was managed by reopening a single year that had already been balanced in Blue Book 2006. For Blue Book

2008, 2004 was chosen as the year to reopen, and the potential for discontinuities between 2003, which was not rebalanced, and 2004 was scrutinised. Although some new data for 2004 had become available the changes could be identified and taken into account when balancing. Through this process of linking the new balance to the old we have aimed to maintain consistency of the time series and address concerns about discontinuities in the data. Whilst such efforts allow you to manage the potential for reductions in quality they do not eliminate the possibility of the results being of lower quality than those produced earlier. In the case of the Blue Book 2008 balance however, it is not thought that these discontinuities have had a significant impact on the quality of the final balanced data. However, it has not been possible to separate the true effects of balancing from the discontinuities present in the unbalanced Supply and Use input data.

Aside from any issues of discontinuity, the main factor contributing to a possible change in quality between the new balances and those of the past is the new balancing approach.

The previous balances were achieved using a dedicated team. This team had remained little changed for many years and had a significant wealth of experience, both in balancing and in some areas of the data. The new arrangements have decentralised the balancing process and brought more people into the balancing domain. As explained above, it has also changed the overall balancing approach from one that initially balanced industries (the columns of the supply and use table) to one that balanced products (the rows of the supply and use table). A description of the new methods and process are given in Annex B.

Whilst not related directly to the production of supply and use tables it is worth noting that the methods used to derive estimates of income used in the sector accounts are less integrated with the supply and use tables than in the past. Previously, balancing of the supply and use tables incorporated a sector view of the components of income. Modernised systems currently do not include this additional level of complexity and have used income components at the whole economy level as inputs to the balancing process. Some caution should thus be taken with the interpretation of sectoral income and its components, as there may be increased uncertainty around them following the introduction of new systems and methods.

Industry and Product detail

New modernised systems have been designed with the aim of being able to populate a supply and use framework with dimensions of 369 products and 197 industries. This is a significant increase on the 123 by 123 matrix that was produced in the past. Whilst data has been compiled at this more detailed level for Blue Book 2008, balancing has taken place at a more aggregate level of 123 products by 108 industries. This less detailed level has been used to enable the new data to be linked with the old and to try to ensure the effect of discontinuities is reduced. It has not been possible to provide a link for industries to the previous 123 level as the industry breakdown used in the new systems does not align exactly at that level. The best alignment being achieved by rolling together some of the industries that were previously shown separately, resulting in the 108 industries used. Details of the industry and product detail, and the comparison between the different levels is given in Annex D.

Detailed Supply and Use estimates

The ONS has historically published a wide range of Supply and Use estimates, both in printed format, and on the National Statistics website. As has been described elsewhere, changed methods for Blue Book 2008 means that not all of the standard publications are available, and those that are have a slightly reduced level of industry detail (see Annex D). The revised Supply and Use tables for 2004 to 2006 will be published on the National Statistics website² on 24 October 2008.

Way forward - what next

The Supply and Use systems and processes used to compile estimates for Blue Book 2008 represent the foundation for the continuation of developments stemming from the modernisation of the national accounts. As such, current price balancing for the latest few years, as carried out in Blue Book 2008, will continue and become part of the regular annual production process for the generation of a single current price estimate of GDP.

The Supply and Use framework will now be developed to facilitate the production of balanced constant price estimates of GDP. On completion of this next stage of work the UK will, for the first time, have a single coherent measure of GDP at constant prices. The aim of this next stage is to develop the methods necessary and produce experimental balances. An article on the progress made alongside a description of the methods used is planned for release during 2009 to accompany the experimental balances. If this work proves successful the aim is for the methods developed to be introduced into production for Blue Book 2010.

Work to develop annual constant price supply and use tables will need to consider the level of detail and quality of the data appropriate for the population and balancing of the tables at constant prices. Current plans are to continue to proceed on the basis of the level of detail used for Blue Book 2008, ie 197 industries and 369 products. However, this level of detail may change as work progresses. The level of detail considered suitable for publication will be assessed as part of the development of these experimental balances.

When annual balancing, at current and constant prices, is firmly incorporated into the regular annual national accounts production process it is expected that work will then move on to develop balancing methods, systems and processes to support the delivery of quarterly balanced estimates of GDP.

Annex A

Some background to National Accounts, Gross Domestic Product (GDP) and the Supply and Use approach

In common with other countries, and following methods and principles^{7;8} agreed by international statistical bodies, the UK National Accounts are built up from a variety of surveys and administrative sources, which measure activity in the economy in different ways. Economic activity, or GDP, in particular can be measured in terms of three distinct approaches: production; expenditure; and income, defined as follows:

1. Production (or Output)

Estimated as the value of the output of goods and services produced, minus the intermediate inputs used in the production of those goods and services; known as Gross Value Added (GVA); plus taxes on products minus subsidies on products

2. Expenditure

Estimated as the value of the **final** expenditure by consumers, non-profit institutions and government; plus gross capital formation; plus exports of goods and services; minus imports of goods and services

3. Income

Estimated as the income earned by individuals and corporations in the production of goods and services: ie. compensation of employees plus gross mixed income plus gross operating surplus; plus taxes on production and imports; minus subsidies on production.

Supply and Use

Whilst each of the three approaches to GDP is attempting to measure the same economic value, the different sources and the statistical and non-statistical errors associated with these sources means that the totals arrived at by the three measures are not consistent. The Supply and Use framework represents a structure that enables you to confront these sources in a coherent way, with the aim of achieving a single measure of GDP. A simplified version of the Supply and Use Tables is shown at figure 3 below:

Figure 3
I-O Supply and Use Tables framework

Supply Table					Use Table													
INDUSTRY					INDUSTRY													
P R O D U C T	DOMESTIC SUPPLY at basic prices			T O T A L S U P P L Y	I M P O R T S O F G O O D S A N D S E R V I C E S	D I S T R I B U T O R S ' T R A D I N G M A R G I N S	T A X E S (L E S S S U B S I D I E S) O N P R O D U C T S	T O T A L I N T E R M E D I A T E D E M A N D a t p u r c h a s e r ' p r i c e s	T O T A L I N T E R M E D I A T E D E M A N D	H H F C E	N P I S H ' F C E	C E N T R A L G O V E R N M E N T F C E	L O C A L G O V E R N M E N T F C E	G R O S S F I X E D C A P I T A L F O R M A T I O N	V A L U A B L E S	C H A N G E S I N I N V E N T O R I E S	E X P O R T S O F G O O D S A N D S E R V I C E S	T O T A L D E M A N D
	Note: Supply Table industry/product detail is not available due to disclosure rules																	
TOTAL OUTPUT					TOTAL INTERMEDIATE DEMAND													
					Total intermediate consumption													
					Taxes (less subsidies) on production													
					Compensation of employees													
					Gross operating surplus													
					TOTAL OUTPUT (INPUTS)													

GVA at basic prices (Primary inputs)

HHFCE represents households final consumption expenditure.
NPISHs FCE represents non-profit institutions serving households final consumption expenditure.

The Supply table shows the elements of domestic supply as well as imports and taxes and subsidies on products. Trade and Transport margins, also known as Distributors' Trading Margins (DTM), are also included as an element of Total Supply.

The Use table is made up of intermediate demand and the final expenditure of Households (HHFCE), Government (GGFCE) and Non-profit Institutions (NPISHFCE). Exports are also included in the Use table, as is Capital expenditure, in the form of Gross Fixed Capital Formation (GFCF), Valuables, and Changes in Inventories. The Use table also shows the incomes of those involved in the economy, as Compensation of Employees (CoE), Gross Operating Surplus (GOS), and taxes and subsidies on Production.

The Supply and Use tables provide a detailed matrix of these accounts, broken down by industry, product and component. Historically, the UK has produced Supply and Use tables showing detail for 123 separate industries and 123 separate products (listed in Annex D), and has balanced the accounts at this level. Although balanced at this level, not all of the detail is published, due to issues of disclosure and commercial confidentiality.

It should be noted that the Domestic Supply matrix is shown at basic prices (the amount paid by the purchaser net of any taxes or subsidies, but not including transport charges), while the intermediate demand element

of the Use table is shown at purchasers' prices (the amount paid by the purchaser, less any deductible taxes, plus any transport charges).

Data Sources

National accounts data generally come from two different types of sources: survey data, and administrative data. Surveys include business surveys such as the Annual Business Inquiry (ABI) and Products of the European Community (PRODCOM), as well as socioeconomic surveys of households, such as the Labour Force Survey (LFS) and Expenditure and Food Survey (EFS). Administrative data includes estimates of taxes on income and profits collected by Her Majesty's Revenue and Customs, banking data collected by the Bank of England and published company accounts. A brief summary of data sources, including those from other government departments and non-government sources is given in Figure 4 below:

Figure 4
Brief Summary of Data Sources

ONS Sources	Other Government Sources	Non-government Sources
Annual Business Inquiry	Bank of England	Association of British Insurers
Business Spend on Capital Items	Department for Environment, Food and Rural Affairs	Civil Aviation Authority
Expenditure and Food Survey	Department of Enterprise, Trade and Investment (Northern Ireland)	Company annual reports and accounts
Financial Inquiries	Department of Health	Company financial websites
Inter-Departmental Business Register	Department for Transport	Regulatory accounts
International Passenger Survey	Department of Health	
International Trade in Services Inquiry	Department of Business, Enterprise and Regulatory Reform	
Labour Force Survey	Her Majesty's Revenue and Customs (including INTRASTAT data)	
Monthly inquiry into Distribution and Services Sector	Her Majesty's Treasury	
Monthly Production Inquiry	Ministry of Defence	
Perpetual Inventory Model	Department for Communities and Local Government	
Products of the European Community		
Quarterly Profits Inquiry		
Quarterly Capital Expenditure		
Quarterly Stocks Inquiry		
Range of ad hoc pilot surveys		
VAT paid and VAT turnover data		

Accounting Relationships of the Supply and Use Tables

The Supply and Demand tables show the accounts in terms of both industries and products. For Products, the Supply and Demand relationship is represented clearly by the tables. For each Product_p:

$Total\ Supply_p = Total\ Demand_p$ such that:

$Domestic\ Supply_p + imports_p + DTM_p + Taxes\ on\ Products_p - Subsidies\ on\ Products_p$

=

$Intermediate\ Demand_p + HHFCE_p + NPISHFCE_p + GGFCE_p + GFCF_p + Inventories_p + Valuables_p + Exports_p$

For Industries, the relationship is slightly more complicated, as it is represented in terms of Gross Value Added (GVA), rather than in simple supply and demand terms. For each Industry_i :

$GVA(Production)_i = GVA(Income)_i$ such that

$Total\ Output_i - Total\ Intermediate\ Consumption_i$

=

$CoE_i + Mixed\ Income_i + GOS_i + Taxes\ on\ Production_i - Subsidies\ on\ Production_i$

Balancing the Supply and Use tables, such that these accounting relationships hold for each industry and product produces estimates for each of the three measures of GDP that also balance to a single estimate.

History of Supply and Use Tables in the UK

The first official UK current price Supply and Use tables were published in 1961, for the year 1954, and were then published roughly every five years until 1992, primarily in order to provide weights for the rebasing of the constant price output measure of GDP. From 1992-2006, Supply and Use Tables were published every year, as part of the annual Blue Book publication round. The Supply and Use tables were suspended in 2007 to allow resources to be targeted towards National Accounts modernisation⁴. The Supply and Use tables for 2004-2006 have now been reinstated as part of the Blue Book 2008 exercise.

Those National Statistical Institute (NSI) that produce Supply and Use matrices do so at different levels, albeit within the confines of the

accepted international industrial⁹ and product¹⁰ classifications. From the mid-1990s up to 2006, the UK Supply and Use tables were balanced at the level of 123 products and 123 industries. As part of the modernisation process, the new systems created for National Accounts have been designed to produce Supply and Use tables at a greater level of industries (197) and products (369). Although produced at this level, it does not automatically follow that the estimates will be balanced or published at this level.

The changes inherent in each new industrial classification have shown the growing importance of the service industries within both the global and UK economies, but until now the industry structure of the SUTs has not changed in line. The extension of the industry matrix, from 123 industries to 197 primarily affects the services sector, and is based on the availability of detailed ABI survey data at this level. Increasing the product matrix, from 123 to 369 products is primarily aimed at the production of constant price SUTs rather than Current Price, as it reflects the level at which deflators (such as Producer Price Indices) are available. There are however, remaining issues with detailed level data available for all components needed at the 369 product level. Whilst the new 369 product matrix provides a direct read-across to the old 123 product level, this is not the case for the industries, where the commonality is only obtained at a level of 108 industries.

Although the detailed unbalanced Supply and Use Tables were constructed at this more detailed level, balancing took place at the level where comparison with the old Supply and Use estimates could still be carried out, in order to benchmark the new balances onto the historical context. This was done therefore at the level of 123 products and 108 industries. A list of industries and products, showing the relationship between the old IO123 industries and products, and the new Supply and Use matrix detail is given in Annex D.

A more detailed history of the development of Supply and Use tables in the UK is given in Mahajan (2006)⁵.

Annex B

Changes in Methods and approach to balancing Supply and Use tables in Blue Book 2008

Method changes

Whilst new modernised systems and processes are being introduced across the national accounts many of the methods used in the construction of current price estimates are little changed. Rather than look at these methods, this section will focus on the methods used within the supply and use framework to derive data that are not available from the basic statistical sources. Such methods are necessary where only overall totals are available from the existing data sources. These need then to be broken down further, by industry and/or product, for use within the supply and use framework. This is the case for taxes, subsidies and margins. These variables are also those necessary to balance the relationship of supply equals demand in terms of the valuation basis of supply and demand. Supply is valued at basic prices and use at purchasers' prices. The difference in valuation being addressed by the components of taxes, subsidies and margins. The methods used to populate the supply and use framework from each of these control totals will be described in the following paragraphs.

Value Added Tax (VAT)

For the population of the supply and use framework it is necessary to be able to allocate VAT receipts to the products to which the tax paid accrues. However, the administrative sources used for VAT only allow the identification of the accrued VAT receipts by government in total, ie there is no product dimension available. The approach taken to address this shortfall in data is to impute the VAT that is paid on each product.

The allocation of the total VAT receipt to products within the supply and use framework makes use of an estimation model. This model uses as its inputs estimates of final and intermediate expenditure on which VAT is charged alongside the rate of VAT applied. Fortunately, the supply and use framework already has available detailed data on intermediate consumption, by product and industry, and all the individual components of final expenditure, by product. The rates of VAT that accrue on different products and their purchasers are available from the tax authorities. The detailed estimates of intermediate and final consumption within the supply table are valued at purchasers' prices, that is they include taxes, subsidies and margins. VAT is paid on the total cost of a product and as such the valuation before the application of VAT includes

the basic price, margins, subsidies and all taxes with the exception of VAT. The implied VAT contained within the purchasers' price of a product can therefore be derived from:

$$\text{VAT accrued} = \text{expenditure at purchasers prices} * \text{VAT rate} / (1 + \text{VAT rate})$$

The basic data on use and tax rates once applied allows the production of matrices of VAT payments for intermediate consumption and final consumption, all by product. When summed these result in the value of imputed VAT receipts. This total can then be compared with the value of VAT receipts to government which forms the overall control total for this element of the accounts. The detailed imputed values can then be adjusted by the ratio of total imputed VAT to total VAT receipts. In estimating the detailed VAT data for use within the supply and use matrix only the estimates of VAT accruing to household consumption is adjusted to address the difference rather than all elements of consumption.

Taxes and subsidies, excluding VAT

Taxes and subsidies on products are estimated in total from the government receipts, by individual tax and subsidy. These need then to be allocated to products to populate the supply and use framework. The method used to do this is similar for each tax and subsidy. The first step is to decide which product or products a tax or subsidy applies to. In many cases this is straightforward. For example, excise duty on tobacco applies to the tobacco product. Where the relationship is one to one (a tax/subsidy allocation to a single product) then the estimate of the receipt of that tax/subsidy is allocated entire to the one product. Where the allocation is more complex then the total receipt needs to be allocated across a range of products. This allocation is made on the basis of the output of the products to which the tax/subsidy is being applied. This assumes that the tax/subsidy accruals in proportion to the supply of the product. Once the individual taxes and subsidies have been allocated to products these can be summed to provide the taxes and subsidies matrix, by product, needed to populate the supply and use framework.

Distributors' Trading Margins

These margins can be estimated in a similar way to that used for VAT although with an additional dimension of complexity. This additional dimension represents the type of margin paid. Output of wholesale and retail industries in the national accounts are measured as the margin they received, ie sales of goods less purchases of goods. These estimates therefore provide control totals of total margin payments that can then be apportioned across products. From the annual benchmark inquiries it is possible to estimate the margins received by different producers. These can be split into categories of wholesalers and retailers.

For each of the categories of margins separate margin rates exist. These are based on the rates that were used in earlier balanced supply and use tables which themselves were originally based on a collection of margin rates. These original margin rates are consequently updated each year as a new balance is struck. This allows margin rates to move over time to better reflect the likely margins on products that are paid although there is little hard data currently available to support the production of margin rates.

As in the calculation of VAT these margin rates can be applied to data on the use side of the supply and use framework to impute the actual margins included in the estimates at purchasers' prices. When aggregated together these produce a total margin, by type of margin. This imputed value can then be compared with that collected from the source statistics and the overall level adjusted to bring the imputed margins into line with the margin control total.

Differences in the balancing approach for Blue Book 2008

Up until Blue Book 2006, the UK had balanced the SUTs using a centralised team of Supply and Use experts, with virtually all balancing done manually. This balancing was based on an industry approach, fixing the level of Output and Income GVA first by industry, and then adjusting the product balances afterwards. Simplified methods of automatic balancing were used at the very end of the process, to deal with small (<£10m) balancing differences. A detailed description of the methods and process used previously can be found in Mahajan(2006)⁵.

For Blue Book 2008 we have used a more decentralised approach to balancing. The sources of data used to populate the supply and use framework have not changed significantly although the computing systems used to marshal together the data and represent the supply and use framework are new. These new systems are an output from the ONS

programme for the modernisation of its statistical systems and processes. The process of balancing is, however, somewhat different to what has been done in the past. Balancing no longer relies on a separate team allocated specifically to balancing the supply and use tables. Those involved in balancing are the compilers of the basic data that form the input to the process. These individuals bring with them an understanding of the data that is being used to populate the supply and use framework. If you considered the supply and use framework as a column (industry) and row (product) matrix the balancing of the data can be viewed as a process of separate column, row and column confrontations of the data.

The process used to produce and balance the national accounts in the past has relied on the knowledge and experience of a small group of people. This creates the potential business risk of becoming unable to support balancing going forward should those key individuals move to other work. By placing the activities of balancing on a small group of individuals you also run the risk of limiting the wider understanding of how the balance has been arrived at. The new process aims to open up the process and make it more transparent. In this way we aim to place less reliance on specific individuals, thus ensuring our ability to balance in the longer term is more secure. Also, by including more individuals in the balancing process we hope to benefit from the wider experience and subject expertise those involved bring to the process.

The first confrontation of data takes place before the supply and use framework is populated. It consists of an examination of the columns in the framework being reviewed for plausibility independently of each other. For example, estimates of household consumption expenditure, by product, are produced and analysed to ensure the overall picture of household spending and its breakdown by product presents a credible picture in their own right. Similarly, for those components with an industry dimension, such as output, the initial stage scrutinises these data to ensure that the industry estimates look plausible. This first stage of confrontation is carried out by the compilers of the original data.

The second stage is a confrontation within the framework of the rows (products) in the supply and use framework. This challenges the data in each row with the aim of achieving a balance across the row, ie that the accounting relationship that the supply of a product is equal to the demand for that product (see Annex A for more detail on the SUT accounting relationships). This confrontation process identifies areas of inconsistency between the various sources which can then be investigated. Data within the row are then subsequently adjusted to

achieve a balance. This adjustment process reviews the quality of the data used to populate the individual cells within a row and makes use of this information to adjust the original data.

The third stage of the balancing process is to confront the columns. Unlike the confrontation within the columns carried out during the first stage this time it is carried out in the context of the supply and use framework. Whilst the second stage of balancing results in a balance of the rows it does not result in satisfying the accounting relationship for the columns, ie that for each industry the inputs to the process of production equal its outputs. This third stage of balancing has the objective of ensuring that this column identity is satisfied.

Once stage three is complete the likelihood, is that the row identities balanced during stage two of the process will have subsequently been broken. The process of repeating stages two and three continues until both the row and column identities are satisfied or a balance can not be achieved. This iterative process of row and column balancing effectively homes in on a position of balance by way of narrowing the degree of imbalance remaining in the supply and use framework after each balancing cycle. Whilst the description above may seem to indicate a fairly mechanistic balancing approach a significant amount of knowledge of the methods and quality of the basic data are used as part of the process. Alongside this the evolving balance is reviewed at each stage to see how the economic picture is developing and make sure that aggregate and detailed time-series estimates are credible.

Annex C

Some Research into Automatic Balancing Methods

As part of the planned modernisation of the UK National Accounts, ONS conducted a high level methods review of the accounts¹¹. This review recommended the development of some form of mechanised balancing for the UK National Accounts, with the aim of being able to balance several years simultaneously, at current and constant prices, whilst maintaining deflators and growth rates.

Automatic Balancing of the National Accounts is not a new concept, but has been around since the 1940s, following the initial work of Sir Richard Stone and others^{12; 13}. Many National Statistical Institutes conduct some form of automatic balancing, even if only to deal with small rounding issues. The UK has historically only used automatic balancing in this way, though did experiment with some variance based balancing for the summary national accounts aggregates in the 1990s¹⁴.

This most recent Automatic Balancing project looked at 4 separate approaches to automatic balancing: RAS Balancing; RAS (Variances) Balancing; Least Squares Balancing; and Linear Programming.

RAS Balancing

RAS Balancing is a form of iterative raking and scaling, originally developed by Stone in the 1960s¹³. A balance is achieved by first apportioning the supply and demand differences for each product across the various industries, and then scaling the industry totals to ensure consistency of output and income GVA. This method is the same as that referred to above, historically used by the UK in apportioning the minor balancing differences. Although relatively easy to design and produce, this balance has serious flaws in that rows and columns can either be adjusted or not, but the amount of balancing, or adjustment cannot be more closely controlled than that. As such it takes no account of the underlying quality of the data, and in effect discards even that small amount of metadata on quality that the National Accountant does possess. This straight-forward RAS Balancing is therefore usually considered as less satisfactory even than manual balancing.

RAS (Variance) Balancing

RAS (Variance) Balancing uses the same Raking and Scaling approach as that used by ordinary RAS balancing above, but uses a variance approach to determine how much balancing affects each component series. In this way, those series whose sources are considered to be of higher quality are less prone to being adjusted, and will not be adjusted by more than the variance allocated. This approach needs a large amount of quality metadata in order to build up the relevant variances. These quality data, such as survey sampling errors, are not available for many of the sources used within the SUT. For this reason, useful RAS Variances balances are considered to be unachievable until such quality metadata are available.

Least-Squares Balancing

Least-Squares Balancing was developed by Stone, Champerdowne and Meade¹² and uses a vector approach to a matrix of variances to derive optimal balances. Least-Squares Balancing also allows for linkages between multiple tables, such as current and constant price tables, by converting the table relationships into linear approximations. Whilst initially promising, ONS's work on Least-Squares Balancing was stopped in 2006, in that it suffered from the same weaknesses as RAS (Variance) Balancing, and computer speed tests showed that it ran much slower.

Linear Programming

Linear programming balancing is a mathematical optimisation method where, in common with other automatic methods, the adjustments produced are weighted by quality factors associated with the reliability of the underlying data. To test linear programming, ONS adopted a linear programming method derived from a 2003 research paper by Jackson and Murray¹⁵. Speed tests of prototype versions showed that linear programming could not balance a large enough matrix to be used for balancing the UK Supply and Use tables, and this balancing method was put on hold in April 2007.

ANNEX D

Relationship between old IO123 industry and product classifications and the classifications used in Blue Book 2008

INDUSTRY CODING				
Consistent with the Standard Industrial Classification 2003¹⁶ (SIC2003), the UK implementation of NACE Rev 1.1⁹.				
SIC 2003	Title	IO123	SUT (197)	BB2008 (108)
01.1-3	Growing of crops; market gardening; horticulture; farming of animals	IO1	01.1-3	IO1
01.4-5	Agricultural and animal husbandry services except veterinary services; landscape gardening; hunting, trapping and game propagation including related service activities		01.4-5	
2	Forestry, logging and related service activities	IO2	2	IO2
5	Fishing, fish farming and related service activities	IO3	5	IO3
10	Mining of coal and lignite; extraction of peat	IO4	10	IO4
11.1	Extraction of crude petroleum and natural gas	IO5	11.1	IO5
11.2	Service activities incidental to oil and gas extraction, excluding surveying		11.2	
12	Mining of uranium & thorium ores	IO7	12-14	IO6-7
13	Mining of metal ores	IO6		
14	Other mining and quarrying	IO7		
15.11	Production and preserving of meat	IO8	15.11	IO8
15.12	Production and preserving of poultry meat		15.12	
15.13	Production of meat and poultry meat products		15.13	
15.2-3	Processing and preserving of fish, fish products; fruit and vegetables	IO9	15.2-3	IO9
15.41	Manufacture of crude oils and fats	IO10	15.41	IO10
15.42	Manufacture of refined oils and fats		15.42	
15.43	Manufacture of margarine and similar edible fats		15.43	
15.51	Operation of dairies and cheese making	IO11	15.51	IO11
15.52	Manufacture of ice cream		15.52	
15.61	Manufacture of grain mill products	IO12	15.61	IO12
15.62	Manufacture of starches and starch products		15.62	
15.71	Manufacture of prepared feeds for farm animals	IO13	15.71	IO13
15.72	Manufacture of prepared pet foods		15.72	
15.81	Manufacture of bread, fresh pastry goods and cakes	IO14	15.81	IO14
15.82	Manufacture of rusks and biscuits; preserved pastry good and cakes		15.82	
15.83	Manufacture of sugar	IO15	15.83	IO15
15.84	Manufacture of cocoa, chocolate and sugar confectionery	IO16	15.84	IO16
15.85-9	Manufacture of macaroni, noodles, couscous and similar farinaceous products; processing of tea and coffee; manufacture of condiments and seasonings; homogenised food preparations and dietetic food; other food products not elsewhere classified	IO17	15.85-9	IO17
15.91/2/7	Manufacture of distilled potable alcoholic beverages; ethyl alcohol from fermented materials and malt	IO18	15.91/2/7	IO18
15.93	Manufacture of wines		15.93	
15.94-5	Manufacture of cider and other fruit wines; other non-distilled fermented beverages		15.94-5	
15.96	Manufacture of beer		15.96	
15.98	Manufacture of mineral waters and soft drinks	IO19	15.98	IO19
16	Manufacture of tobacco products	IO20	16	IO20

SIC 2003	Title	IO123	CORD (197)	BB2008 (108)
17.1	Preparation and spinning of textile fibres	IO21	17.1-3	1021-23
17.2	Textile weaving	IO22		
17.3	Finishing of textiles	IO23		
17.4	Manufacture of made-up textiles except apparel	IO24	17.4-7	IO24-27
17.51	Manufacture of carpets and rugs	IO25		
17.52-4	Manufacture of cordage, rope, twine and netting; non-wovens and articles made from non-wovens except apparel and other textiles not elsewhere classified	IO26		
17.6-7	Manufacture of knitted and crocheted fabrics and articles	IO27		
18	Manufacture of wearing apparel; dressing and dyeing of fur	IO28	18	IO28
19.1-2	Manufacture of leather and leather products except footwear	IO29	19	IO29-30
19.3	Manufacture of footwear	IO30		
20	Manufacture of wood and products of wood except furniture, articles of straw and plaiting materials	IO31	20	IO31
21.1	Manufacture of pulp, paper and paperboard	IO32	21.1	IO32
21.2	Manufacture of articles of paper and paperboard	IO33	21.2	IO33
22.11	Publishing of books	IO34	22.11	IO34
22.12	Publishing of newspapers		22.12	
22.13	Publishing of journals and periodicals		22.13	
22.14-15	Other publishing		22.14-15	
22.2-3	Printing and reproduction of recorded media		22.2-3	
23.1-2	Manufacture of coke and refined petroleum products	IO35	23.1-2	IO35
23.3	Processing of nuclear fuel		23.3	
24.11-12	Manufacture of industrial gases, dyes and pigments	IO36	24.11-12	IO36
24.13	Manufacture of other inorganic basic chemicals	IO37	24.13-4	IO37-38
24.14	Manufacture of other organic basic chemicals	IO38		
24.15	Manufacture of fertilisers and nitrogen compounds	IO39	24.15-2	IO39-41
24.16-17	Manufacture of plastics and synthetic rubber in primary forms	IO40		
24.2	Manufacture of pesticides and other agro-chemical products	IO41		
24.3	Manufacture of paints, varnishes and similar coatings, printing inks and mastics	IO42	24.3	IO42
24.4	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	IO43	24.4	IO43
24.5	Manufacture of soap and detergents, cleaning and polishing preparations, perfume and toilet preparations	IO44	24.5	IO44
24.6	Manufacture of other chemical products	IO45	24.6-7	IO45-46
24.7	Manufacture of man-made fibres	IO46		
25.1	Manufacture of rubber products	IO47	25.1	IO47
25.2	Manufacture of plastic products	IO48	25.2	IO48
26.1	Manufacture of glass and glass products	IO49	26.1	IO49
26.2-3	Manufacture of non-refractory ceramic goods other than for construction purposes, refractory ceramic products; ceramic tiles and flags	IO50	26.2-3	IO50
26.4	Manufacture of bricks, tiles and construction products, in baked clay	IO51	26.4-5	IO51-52
26.5	Manufacture of cement, lime and plaster	IO52		
26.6-8	Manufacture of articles of concrete, plaster and cement; cutting, shaping and finishing of ornamental and building stone; manufacture of other non-metallic mineral products	IO53	26.6-8	IO53

SIC 2003	Title	IO123	CORD (197)	BB2008 (108)
27.1	Manufacture of basic iron and steel and of ferro-alloys	IO54	27.1	IO54-56
27.22	Manufacture of steel tubes		27.22	
27.31	Cold drawing		27.31	
27.32	Cold rolling of narrow strip		27.32	
27.21	Manufacture of cast-iron tubes		27OTH	
27.33	Cold forming or folding			
27.34	Wire drawing			
27.4	Manufacture of basic precious and non-ferrous metals	IO55		
27.5	Other manufacture of basic metals	IO56		
28.1	Manufacture of structural metal products	IO57	28.1	IO57
28.2-3	Manufacture of tanks, reservoirs and containers of metal, central heating radiators and boilers; and steam generators except central heating hot water boilers	IO58	28.2-3	IO58
28.4-5	Forging, pressing, stamping, roll forming of metal and powder metallurgy; treatment and coating of metals and general mechanical engineering	IO59	28.4-5	IO59
28.6	Manufacture of cutlery, tools and general hardware	IO60	28.6	IO60
28.7	Manufacture of other fabricated metal products	IO61	28.7	IO61
29.1	Manufacture of machinery for the production and use of mechanical power except aircraft, vehicle and cycle engines	IO62	29.1	IO62
29.2	Manufacture of other general purpose machinery	IO63	29.2	IO63
29.3	Manufacture of agricultural and forestry machinery	IO64	29.3	IO64
29.4	Manufacture of machine tools	IO65	29.4	IO65
29.5	Manufacture of other special purpose machinery	IO66	29.5	IO66
29.6	Manufacture of weapons and ammunition	IO67	29.6	IO67
29.7	Manufacture of domestic appliances not elsewhere classified	IO68	29.7	IO68
30	Manufacture of office machinery and computers	IO69	30	IO69
31.1	Manufacture of electric motors, generators and transformers	IO70	31.1	IO70-71
31.2	Manufacture of electricity distribution and control apparatus		31.2-3	
31.3	Manufacture of insulated wire and cable			
31.4-6	Manufacture of accumulators, primary cells and primary batteries; lighting equipment and electric lamps; electrical equipment not elsewhere classified	IO72	31.4-6	IO72
32.1	Manufacture of electronic valves and tubes and other electronic components	IO73	32.1	IO73
32.2	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	IO74	32.2	IO74
32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods	IO75	32.3	IO75
33.1	Manufacture of medical and surgical equipment and orthopaedic appliances	IO76	33.1	IO76
33.2-3	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment; manufacture of industrial process control equipment		33.2-3	
33.4-5	Manufacture of optical instruments, photographic equipment; watches and clocks		33.4-5	
34.1	Manufacture of motor vehicles		IO77	
34.2-3	Manufacture of bodies (coachwork) for motor vehicles, trailers and semi-trailers; parts and accessories for motor vehicles and their engines	34.2-3		IO77
35.1	Building and repairing of ships and boats	IO78	35.1	IO78

SIC 2003	Title	IO123	CORD (197)	BB2008 (108)
35.2	Manufacture of railway and tramway locomotives and rolling stock	IO79	35.2	IO79
35.4-5	Manufacture of motorcycles and bicycles; other transport equipment not elsewhere classified		35.4-5	
35.3	Manufacture of aircraft and spacecraft	IO80	35.3	IO80
36.1	Manufacture of furniture	IO81	36.1	IO81
36.2-3	Manufacture of jewellery and related articles; and musical instruments	IO82	36.2-3	IO82
36.4-5	Manufacture of sports goods; games and toys	IO83	36.4-5	IO83
36.6	Miscellaneous manufacturing not elsewhere classified	IO84	36.6	IO84
37	Recycling		37	
40.1	Production and distribution of electricity	IO85	40.1	IO85
40.2-3	Manufacture of gas and distribution of gaseous fuels through mains; steam and hot water supply	IO86	40.2-3	IO86
41	Collection, purification and distribution of water	IO87	41	IO87
45	Construction	IO88	45	IO88
50.1	Sale of motor vehicles	IO89	50.1	IO89
50.2	Maintenance and repair of motor vehicles		50.2	
50.3	Sale of motor vehicle parts and accessories		50.3	
50.4	Sale, maintenance and repair of motorcycles and related parts and accessories		50.4	
50.5	Retail sale of automotive fuel		50.5	
51	Wholesale trade and commission trade, except of motor vehicles	IO90	51	IO90
52.1-6	Retail trade, except of motor vehicles and motorcycles	IO91	52.1-6	IO91
52.7	Repair of personal and household goods		52.7	
55.1	Hotels	IO92	55.1	IO92
55.2	Camping sites and other provision of short-stay accommodation		55.2	
55.3	Restaurants		55.3	
55.4	Bars		55.4	
55.5	Canteens and catering		55.5	
60.1	Transport via railways	IO93	60.1	IO93
60.21	Other scheduled passenger land transport	IO94	60.21	IO94
60.22	Taxi operation		60.22	
60.23	Other land passenger transport		60.23	
60.24	Freight transport by road		60.24	
60.3	Transport via pipelines		60.3	
61.101	Passenger sea and coastal water transport	IO95	61.1P	IO95
61.102	Freight sea and coastal water transport		61.1F	
61.2	Inland water transport		61.2	
62	Air transport	IO96	62	IO96
63.1	Cargo handling and storage	IO97	63.1	IO97
63.21	Other supporting land transport activities		63.21	
63.22	Other supporting water transport activities		63.22	
63.23	Other supporting air transport activities		63.23	
63.3	Activities of travel agencies and tour operators; tourist assistance agencies not elsewhere classified		63.3	
63.4	Activities of other transport agencies		63.4	
64.11	National post activities	IO98	64.11	IO98
64.12	Courier activities other than national post activities		64.12	
64.2	Telecommunications	IO99	64.2	IO99

SIC 2003	Title	IO123	CORD (197)	BB2008 (108)
65.1	Monetary intermediation	IO100	65.1	IO100
65.2	Other financial intermediation		65.2	
66.01	Life insurance	IO101	66.01	IO101
66.02	Pension funding		66.02	
66.03	Non-life insurance		66.03	
67	Activities auxiliary to financial intermediation	IO102	67	IO102
70.1	Real estate activities with own property	IO103	70.1	IO103
70.2	Letting of own property other than dwellings		70.2A	
-	Letting of own dwellings	IO104	70.2B	IO104
-	Imputed rent of owner-occupied dwellings		70.2C	
70.31	Real estate agencies	IO105	70.31	IO105
70.32	Management of real estate on a fee or contract basis		70.32	
71.1	Renting of automobiles	IO106	71.1	IO106
71.2	Renting of other transport equipment		71.2	
71.31/34	Renting of agricultural machinery and equipment; other machinery and equipment not elsewhere classified		71.31/4	
71.32	Renting of construction and civil engineering machinery and equipment		71.32	
71.33	Renting of office machinery and equipment including computers		71.33	
71.4	Renting of personal and household goods not elsewhere classified		71.4	
72.2	Software consultancy and supply	IO107	72.2	IO107
72.5	Maintenance and repair of office, accounting and computing machinery		72.5	
72.1/3/4/6	Hardware consultancy; data processing; database activities; other computer related activities		72OTH	
73	Research and development	IO108	73	IO108
74.11	Legal activities	IO109	74.11	IO109
74.12	Accounting, book-keeping and auditing activities; tax consultancy	IO110	74.12	IO110
74.13	Market research and public opinion polling	IO111	74.13	IO111
74.14	Business and management consultancy activities		74.14	
74.15	Management activities of holding companies		74.15	
74.2	Architectural and engineering activities and related technical consultancy	IO112	74.2	IO112
74.3	Technical testing and analysis		74.3	
74.4	Advertising	IO113	74.4	IO113
74.5	Labour recruitment and provision of personnel	IO114	74.5	IO114
74.6	Investigation and security activities		74.6	
74.7	Industrial cleaning		74.7	
74.81	Photographic activities		74.81	
74.82	Packaging activities		74.82	
74.85-6	Secretarial and translation activities; call centre activities		74.85-6	
74.87	Other business activities not elsewhere classified	74.87		
75.1/21	Administration of the State and the economic and social policy of the community; foreign affairs	IO115	75.X	IO115
75.22	Defence activities		75.22	
75.23	Justice and judicial activities		75.23	
75.24	Public security, law and order activities		75.24	
75.25	Fire service activities		75.25	
75.3	Compulsory social security activities		75.3	

SIC 2003	Title	IO123	CORD (197)	BB2008 (108)
80.1-3	Primary; secondary; and higher education	IO116	80.1-3	IO116
80.4	Adult and other education		80.4	
85.1	Human health activities	IO117	85.1	IO117
85.2	Veterinary activities		85.2	
85.3	Social work activities	IO118	85.3	IO118
90	Sewage and refuse disposal, sanitation and similar activities	IO119	90	IO119
91.1/3	Activities of business, employers and professional organisations; other membership organisations	IO120	91.1/3	IO120
91.2	Activities of trade unions		91.2	
92.1	Motion picture and video activities	IO121	92.1	IO121
92.2	Radio and television activities		92.2	
92.31	Artistic and literary creation and interpretation		92.31	
92.32-34	Operation of arts facilities; fair and amusement park activities; other entertainment activities not elsewhere classified		92.32-34	
92.4	News agency activities		92.4	
92.5	Library, archives, museums and other cultural activities		92.5	
92.6/72	Sporting activities; other recreational activities not elsewhere classified		92.6/72	
92.71	Gambling and betting activities		92.71	
93.01	Washing and dry cleaning of textile and fur products	IO122	93.01	IO122
93.02	Hairdressing and other beauty treatment		93.02	
93.03	Funeral and related activities		93.03	
93.04-05	Physical well-being activities; other service activities not elsewhere classified		93.04-05	
95	Activities of households as employers of domestic staff	IO123	95	IO123

PRODUCT CODING**Consistent with the Classification of Products by Activity (CPA2003)¹⁰**

CPA Code	CPA Title	SUT (369)	IO123
01.11	Cereals and other crops not elsewhere classified.	1.11	1
01.12	Vegetables, horticultural specialities and nursery products	1.12	
01.13	Fruit, nuts, beverage and spice crops	1.13	
01.21	Bovine cattle, live and their products	1.21	
01.22	Sheep, goats, horses, asses, mules and hinnies, live, and their products	1.22	
01.23	Swine, live	1.23	
01.24	Poultry, live, and eggs	1.24	
01.25	Other animals, live, and their products	1.25	
01.4-5	Agricultural and animal husbandry services except veterinary services; landscape gardening services; Hunting, trapping, game propagation and related services	01.4-5	
02	Products of forestry, logging and related services	2	
05	Fish and other fishing products; services incidental to fishing	5	3
10.1-2	Hard coal; lignite	10.1-2	4
10.3	Peat	10.3	
11.10.1/4	Crude petroleum	11.1OIL	5
11.10.2-3	Natural gas	11.1GAS	
11.2	Services incidental to oil and gas extraction, excluding surveying	11.2	
12	Uranium and thorium ores	12	6
13.1	Iron ores	13.1	
13.2	Non-ferrous metal ores, except uranium and thorium ores	13.2	
14.11	Ornamental or building stone	14.11	7
14.12	Limestone, gypsum and chalk	14.12	
14.13	Slate	14.13	
14.21	Gravel and sand	14.21	
14.22	Clays and kaolin	14.22	
14.3	Chemical and fertilizer minerals	14.3	
14.4	Salt	14.4	
14.5	Other mining and quarrying products not elsewhere classified	14.5	
15.11	Fresh and preserved meat, except poultry	15.11	8
15.12	Fresh and preserved poultry meat	15.12	
15.13	Meat and poultry meat products	15.13	
15.2	Processed and preserved fish and fish products	15.2	9
15.31	Processed and preserved potatoes	15.31	
15.32	Fruit and vegetable juices	15.32	
15.33	Processed and preserved fruit and vegetables not elsewhere classified.	15.33	10
15.41	Crude oils and fats	15.41	
15.42	Refined oils and fats	15.42	
15.43	Margarine and similar edible fats	15.43	11
15.51	Dairy products	15.51	
15.52	Ice cream and other edible ice	15.52	12
15.61	Grain mill products	15.61	
15.62	Starches and starch products	15.62	13
15.71	Prepared animal feeds for farm animals	15.71	
15.72	Prepared pet food	15.72	

CPA Code	CPA Title	CORD (369)	IO123
15.81	Bread, fresh pastry goods and cakes	15.81	14
15.82	Rusks and biscuits; preserved pastry goods and cakes	15.82	
15.83	Sugar	15.83	15
15.84	Cocoa; chocolate and sugar confectionery	15.84	16
15.85	Macaroni, noodles, couscous and similar farinaceous products	15.85	17
15.86	Coffee and tea	15.86	
15.87	Condiments and seasonings	15.87	
15.88	Homogenized food preparations and dietetic food	15.88	
15.89	Other food products not elsewhere classified	15.89	
15.91	Distilled alcoholic beverages	15.91	18
15.92	Ethyl alcohol	15.92	
15.93	Wines	15.93	
15.94	Cider and other fruit wines	15.94	
15.95	Other non-distilled fermented beverages	15.95	
15.96	Beer made from malt	15.96	
15.97	Malt	15.97	
15.98	Mineral waters and soft drinks	15.98	19
16	Tobacco products	16	20
17.1	Textile yarn and thread	17.1	21
17.2	Textile fabrics	17.2	22
17.3	Textile finishing services	17.3	23
17.4	Made-up textile articles, except apparel	17.4	24
17.51	Carpets and rugs	17.51	25
17.52	Cordage, rope, twine and netting	17.52	26
17.53	Nonwovens and articles made from nonwovens, except apparel	17.53	
17.54	Other textiles not elsewhere classified	17.54	
17.6	Knitted or crocheted fabrics	17.6	27
17.71	Knitted and crocheted hosiery	17.71	
17.72	Knitted and crocheted pullovers, cardigans and similar articles	17.72	
18.1	Leather clothes	18.1	28
18.21	Workwear	18.21	
18.22	Outerwear	18.22	
18.23	Underwear	18.23	
18.24	Other wearing apparel and accessories not elsewhere classified	18.24	
18.3	Furs; articles of fur	18.3	
19.1	Leather	19.1	29
19.2	Luggage, handbags and the like; saddlery and harness	19.2	29
19.3	Footwear	19.3	30
20.1	Wood, sawn, planed or impregnated	20.1	31
20.2	Veneer sheets; plywood, laminboard; particle board, fibre board and other panels and boards	20.2	
20.3	Builders' joinery and carpentry, of wood	20.3	
20.4	Wooden containers	20.4	
20.51	Other products of wood	20.51	
20.52	Articles of cork, straw and plaiting materials	20.52	
21.11	Pulp	21.11	32
21.12	Paper and paperboard	21.12	

CPA Code	CPA Title	CORD (369)	IO123
21.21	Corrugated paper and paperboard and containers of paper and paperboard	21.21	33
21.22	Household and toilet paper and paper products	21.22	
21.23	Paper stationery	21.23	
21.24	Wallpaper	21.24	
21.25	Other articles of paper and paperboard not elsewhere classified	21.25	
22.11	Books	22.11	34
22.12	Newspapers, journals and periodicals, appearing at least four times a week	22.12	
22.13	Newspapers, journals and periodicals, appearing less than four times a week	22.13	
22.14	Sound recordings	22.14	
22.15	Postcards, greeting cards, pictures and similar matter	22.15	
22.21	Newspaper printing services	22.21	
22.22	Printing services not elsewhere classified	22.22	
22.23	Bookbinding services	22.23	
22.24	Pre-press services	22.24	
22.25	Ancillary services related to printing	22.25	
22.31	Reproduction services of sound recording	22.31	
22.32	Reproduction services of video recording	22.32	
22.33	Reproduction services of software	22.33	
23.1	Coke oven products	23.1	35
23.2	Refined petroleum products	23.2	
23.3	Nuclear fuel	23.3	
24.11	Industrial gases	24.11	36
24.12	Dyes and pigments	24.12	
24.13	Other basic inorganic chemicals	24.13	37
24.14	Other basic organic chemicals	24.14	38
24.15	Fertilizers and nitrogen compounds	24.15	39
24.16	Plastics in primary forms	24.16	40
24.17	Synthetic rubber in primary forms	24.17	
24.2	Pesticides and other agro-chemical products	24.2	41
24.3	Paints, varnishes and similar coatings, printing ink and mastics	24.3	42
24.41	Basic pharmaceutical products	24.41	43
24.42	Pharmaceutical preparations	24.42	
24.51	Glycerol; soap and detergents, cleaning and polishing preparations	24.51	44
24.52	Perfumes and toilet preparations	24.52	
24.61	Explosives	24.61	45
24.62	Glues and gelatines	24.62	
24.63	Essential oils	24.63	
24.64	Photographic chemical material	24.64	
24.65	Prepared unrecorded media	24.65	
24.66	Other chemical products not elsewhere classified	24.66	
24.7	Man-made fibres	24.7	46
25.11	New and used rubber tyres and tubes	25.11	47
25.12	Retreaded pneumatic tyres, of rubber	25.12	
25.13	Other rubber products	25.13	

CPA Code	CPA Title	CORD (369)	IO123
25.21	Plastic plates, sheets, tubes and profiles	25.21	48
25.22	Packaging products of plastics	25.22	
25.23	Builders' ware of plastics	25.23	
25.24	Other plastic products	25.24	
26.11	Flat glass	26.11	49
26.12	Shaped and processed flat glass	26.12	
26.13	Hollow glass	26.13	
26.14	Glass fibres	26.14	
26.15	Other glass, processed, including technical glassware	26.15	
26.21	Ceramic household and ornamental articles	26.21	50
26.22	Sanitary ceramic fixtures	26.22	
26.23	Ceramic insulators and insulating fittings	26.23	
26.24	Technical ceramic wares	26.24	
26.25	Ceramic articles not elsewhere classified	26.25	
26.26	Refractory ceramic goods	26.26	
26.3	Ceramic tiles and flags	26.3	51
26.4	Bricks, tiles and construction products, in baked clay	26.4	
26.51	Cement	26.51	52
26.52	Lime	26.52	
26.53	Plaster	26.53	
26.61	Concrete products for construction purposes	26.61	53
26.62	Plaster products for construction purposes	26.62	
26.63	Ready-mixed concrete	26.63	
26.64	Mortars	26.64	
26.65	Articles of fibre cement	26.65	
26.66	Other articles of plaster, concrete or cement	26.66	
26.7	Cut, shaped and finished ornamental and building stone and articles	26.7	
26.81	Abrasive products	26.81	54
26.82	Other non-metallic mineral products not elsewhere classified	26.82	
27.1	Basic iron and steel and ferro-alloys	27.1	
27.21	Tubes and tube fittings, of cast iron	27.21	
27.22	Steel tubes and steel tube fittings	27.22	
27.31	Cold drawn products	27.31	
27.32	Cold-rolled narrow strip	27.32	
27.33	Cold formed or folded products of iron, non-alloy steel or stainless steel	27.33	
27.34	Wire	27.34	55
27.41	Precious metals	27.41	
27.42	Aluminium and aluminium products	27.42	
27.43	Lead, zinc and tin and products thereof	27.43	
27.44	Copper products	27.44	
27.45	Other non-ferrous metal products	27.45	56
27.51	Casting services of iron	27.51	
27.52	Casting services of steel	27.52	
27.53	Casting services of light metals	27.53	
27.54	Casting services of other non-ferrous metals	27.54	57
28.11	Metal structures and parts of structures	28.11	
28.12	Builders' carpentry and joinery of metal	28.12	

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28.21	Tanks, reservoirs and containers of metal	28.21	58
28.22	Central heating radiators and boilers	28.22	
28.3	Steam generators, except central heating hot water boilers	28.3	
28.4	Forging, pressing, stamping and roll forming services of metal; powder metallurgy	28.4	59
28.51	Treatment and coating services of metal	28.51	
28.52	General mechanical engineering services	28.52	
28.61	Cutlery	28.61	60
28.62	Tools	28.62	
28.63	Locks and hinges	28.63	
28.71	Steel drums and similar containers	28.71	61
28.72	Light containers, of metal	28.72	
28.73	Wire products	28.73	
28.74	Fasteners, screw machine products, chain and springs	28.74	
28.75	Other fabricated metal products not elsewhere classified	28.75	62
29.11	Engines and turbines except aircraft, vehicle and cycle engines	29.11	
29.12	Pumps and compressors	29.12	
29.13	Taps and valves	29.13	
29.14	Bearings, gears, gearing and driving elements	29.14	63
29.21	Furnaces and furnace burners	29.21	
29.22	Lifting and handling equipment	29.22	
29.23	Non-domestic cooling and ventilation equipment	29.23	
29.24	Other general purpose machinery not elsewhere classified	29.24	64
29.31	Agricultural tractors	29.31	
29.32	Other agricultural and forestry machinery	29.32	65
29.4	Machine tools	29.4	
29.51	Machinery for metallurgy	29.51	66
29.52	Machinery for mining, quarrying and construction	29.52	
29.53	Machinery for food, beverage and tobacco processing	29.53	
29.54	Machinery for textile, apparel and leather production	29.54	
29.55	Machinery for paper and paperboard production	29.55	
29.56	Other special purpose machinery not elsewhere classified	29.56	
29.6	Weapons and ammunition	29.6	67
29.71	Electric domestic appliances	29.71	68
29.72	Non-electric domestic appliances	29.72	
30.01	Office machinery and parts thereof	30.01	69
30.02	Computers and other information processing equipment	30.02	
31.1	Electric motors, generators and transformers	31.1	70
31.2	Electricity distribution and control apparatus	31.2	
31.3	Insulated wire and cable	31.3	71
31.4	Accumulators, primary cells and primary batteries	31.4	72
31.5	Lighting equipment and electric lamps	31.5	
31.61	Electrical equipment for engines and vehicles not elsewhere classified	31.61	
31.62	Other electrical equipment not elsewhere classified	31.62	
32.1	Electronic valves and tubes and other electronic components	32.1	73
32.2	Television and radio transmitters; apparatus for line telephony and telegraphy	32.2	74

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32.3	Television and radio receivers; sound or video recording or reproducing apparatus and associated goods	32.3	75
33.1	Medical and surgical equipment and orthopaedic appliances	33.1	76
33.2	Instruments and appliances for measuring, checking, testing, navigating and other purposes	33.2	
33.3	Industrial process control equipment	33.3	
33.4	Optical instruments and photographic equipment	33.4	
33.5	Watches and clocks	33.5	
34.1	Motor vehicles	34.1	77
34.2	Bodies (coachwork) for motor vehicles; trailers and semi-trailers	34.2	
34.3	Parts and accessories for motor vehicles and their engines	34.3	
35.11	Ships	35.11	78
35.12	Pleasure and sporting boats	35.12	
35.2	Railway and tramway locomotives and rolling-stock	35.2	79
35.41	Motorcycles	35.41	
35.42	Bicycles	35.42	
35.43	Invalid carriages	35.43	
35.5	Other transport equipment not elsewhere classified	35.5	
35.3	Aircraft and spacecraft	35.3	80
36.11	Chairs and seats	36.11	81
36.12	Other office and shop furniture	36.12	
36.13	Kitchen furniture	36.13	
36.14	Other furniture	36.14	
36.15	Mattresses	36.15	
36.21	Coins	36.21	82
36.22	Jewellery and related articles not elsewhere classified	36.22	
36.3	Musical instruments	36.3	83
36.4	Sports goods	36.4	
36.5	Games and toys	36.5	
36.61	Imitation jewellery	36.61	
36.62	Brooms and brushes	36.62	
36.63	Other manufactured goods not elsewhere classified	36.63	84
37.1	Metal secondary raw materials	37.1	85
37.2	Non-metal secondary raw materials	37.2	
40.1	Production and distribution services of electricity	40.1	86
40.2	Manufactured gas and distribution services of gaseous fuels through mains	40.2	
40.3	Steam and hot water supply services	40.3	87
41	Collected and purified water; distribution services of water	41	
45	New public housing	45NDPS	88
	New private housing	45NDPT	
	New infrastructure	45INF	
	New public industrial and commercial buildings	45NBPS	
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	Repair and maintenance of public housing	45RDPS	
	Repair and maintenance of private housing	45RDPT	
	Repair and maintenance of public industrial and commercial buildings	45RBPS	
Repair and maintenance of private industrial and commercial buildings	45RBPT		

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50.1	Trade services of motor vehicles	50.1	89
50.2	Maintenance and repair services of motor vehicles	50.2	
50.3	Trade services of motor vehicle parts and accessories	50.3	
50.4	Trade, maintenance and repair services of motorcycles and related parts and accessories	50.4	
50.5	Retail trade services of motor fuel	50.5	
51	Wholesale trade and commission trade services, except of motor vehicles and motorcycles	51	90
52.1-6	Retail trade, except of motor vehicles and motorcycles	52.1-6	91
52.71	Repair services of boots, shoes and other articles of leather	52.71	
52.72	Repair services of electrical household goods	52.72	
52.73	Repair services of watches, clocks and jewellery	52.73	
52.74	Repair services of other personal and household goods	52.74	
55.1	Hotel services	55.1	92
55.2	Camping sites and other short stay accommodation services	55.2	
55.3	Food serving services	55.3	
55.4	Beverage serving services	55.4	
55.5	Canteen and catering services	55.5	
60.1	Railway transportation services	60.1	93
60.21	Other scheduled passenger land transportation services	60.21	94
60.22	Taxi services and rental services of passenger cars with driver	60.22	
60.23	Other land passenger transportation services	60.23	
60.24	Freight transportation services by road	60.24	
60.3	Transportation services via pipelines	60.3	
61.10.1	Sea and coastal passenger water transportation services	61.1P	95
61.10.2	Sea and coastal freight water transportation services	61.1F	
61.2	Inland water transportation services	61.2	
62	Air transport services	62	96
63.1	Cargo handling and storage services	63.1	97
63.21	Other supporting services for land transport	63.21	
63.22	Other supporting services for water transport	63.22	
63.23	Other supporting services for air transport	63.23	
63.3	Travel agency and tour operator services; tourist assistance services not elsewhere classified	63.3	
63.4	Other transport agency services	63.4	
64.11	National post services	64.11	98
64.12	Courier services other than national post services	64.12	
64.2	Telecommunications services	64.2	99
65.1	Monetary intermediation services	65.1	100
65.2	Other financial intermediation services	65.2	
66.01	Life insurance services	66.01	101
66.02	Pension funding services	66.02	
66.03	Non-life insurance services	66.03	
67	Services auxiliary to financial intermediation	67	102
70.1	Real estate services with own property	70.1	103
70.20.12	Renting or leasing services involving own non-residential property	70.2A	
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-	Imputed rent of owner occupied dwellings	70.2C	

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70.31	Real estate agency services on a fee or contract basis	70.31	105
70.32	Management services of real estate on a fee or contract basis	70.32	
71.1	Renting services of automobiles	71.1	106
71.2	Renting services of other transport equipment	71.2	
71.31/4	Renting services of agricultural machinery and equipment; other machinery and equipment not elsewhere classified	71.31/4	
71.32	Renting services of construction and civil engineering machinery and equipment	71.32	
71.33	Renting services of office machinery and equipment including computers	71.33	
71.4	Renting services of personal and household goods not elsewhere classified	71.4	
72.2	Software consultancy and supply services	72.2	
72.5	Maintenance and repair services of office, accounting and computing machinery	72.5	
72.1/3/4/6	Hardware consultancy services; data processing services; database services; other computer-related services	72OTH	
73	Research and development services	73	108
74.11	Legal services	74.11	109
74.12	Accounting, book-keeping and auditing services; tax consultancy services	74.12	110
74.13	Market research and public opinion polling services	74.13	111
74.14	Business and management consultancy services	74.14	
74.15	Management holdings services	74.15	
74.2	Architectural, engineering and related technical consultancy services	74.2	112
74.3	Technical testing and analysis services	74.3	
74.4	Advertising services	74.4	113
74.5	Labour recruitment and provision of personnel services	74.5	114
74.6	Investigation and security services	74.6	
74.7	Industrial cleaning services	74.7	
74.81	Photographic services	74.81	
74.82	Packaging services	74.82	
74.85-6	Secretarial and translation services; call centre activities	74.85-6	
74.87	Other business services	74.87	
75.1-21	Administration of the state and the economic and social policy of the community; foreign affairs	75.X	115
75.22	Defence services	75.22	
75.23	Justice and judicial services	75.23	
75.24	Public security, law and order services	75.24	
75.25	Fire brigade services	75.25	
75.3	Compulsory social security services	75.3	
80.1-3	Primary; secondary; and higher education services	80.1-3	116
80.4	Adult and other education services	80.4	
85.1	Human health services	85.1	117
85.2	Veterinary services	85.2	
85.3	Social work services	85.3	118
90	Sewage and refuse disposal services, sanitation and similar services	90	119
91.1/3	Services furnished by business, employers and professional organisations; other membership organisations services	91.1/3	120
91.2	Services furnished by trade unions	91.2	

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92.1	Motion picture and video services	92.1	121
92.2	Radio and television services	92.2	
92.31	Artistic and literary creation and interpretation services	92.31	
92.32-4	Arts facilities operation services; fair and amusement park services; other entertainment services not elsewhere classified	92.32-4	
92.4	News agency services	92.4	
92.5	Library, archives, museums and other cultural services	92.5	
92.6/72	Sporting services; other recreational services not elsewhere classified	92.6/72	
92.71	Gambling and betting services	92.71	
93.01	Washing and dry cleaning services	93.01	122
93.02	Hairdressing and other beauty treatment services	93.02	
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93.04-5	Physical well-being services; other services not classified elsewhere	93.04-5	
95	Services of households as employers of domestic staff	95	123

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